STATE OF MISSOURI
Mel Carnahan, Governor • David A. Shorr, Director
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102-0176

July 26, 1996

Mr. David V. Crawford
SACR/SUPR
U.S. Environmental Protection Agency
Region VII
726 Minnesota Avenue
Kansas City, KS 66101

RE: Removal Site Evaluation
Hubert Wheeler State School Site
St. Louis, Missouri

Dear Mr. Crawford:

This letter summarizes the results of Removal Site Evaluation (RSE) activities conducted by the Missouri Department of Natural Resources' (DNR) Hazardous Waste Program (HWP) at the Hubert Wheeler State School site.

In February 1996, DNR and the Missouri Department of Health (DOH) conducted Community Interviews, and reviewed historical documents at the St. Louis Public Library. According to this information, an excavated area, left behind by the former Laclede-Christy clay mine, was used as a waste disposal area from the early 1900's to the mid-1960's. This former pit area includes the current Hubert Wheeler State School property, and portions of the surrounding residential neighborhood.

A variety of waste materials were disposed in the pit, including cinders, ash, medical wastes, spoiled food, glass, brick, and X-rays. In addition to these materials, free-product, tar, and 12-18 filled 55-gallon drums of tar were reportedly buried on the Hubert Wheeler State School property.

In March 1996, DNR conducted shallow soil sampling at 22 residences near the Hubert Wheeler State School property. Deeper soil samples were collected from two commercial properties, and three residential locations.

Eighteen polycyclic aromatic hydrocarbons (PAHs), bis (2-ethylhexyl) phthalate, 2,4-dinitrotoluene, and lead were detected in the residential soil samples. DOH conducted an expedited risk assessment, and a health consultation for the residential properties. DOH determined that unlimited contact with the residential soils may pose a slight health risk. Based upon this information, we do not recommend any additional action at the residential properties.

The HWP requests that EPA conduct a non-time critical Removal Action at the Hubert Wheeler State School property to delineate and remove the suspected source(s) of tar-like material. Previous analytical results of the tar-like material, collected by DNR in July 1994, found that 17 PAH compounds were present in the substance at values exceeding 1,000 parts per million (ppm), including benzo(a)pyrene at 32,000 ppm.

If you have any questions regarding this Removal Site Evaluation, or need additional information, please contact Mr. Robert Hinkson, Project Manager, or me at (573) 751-3176.

Sincerely,

HAZARDOUS WASTE PROGRAM

Julie Warren

Julie Warren, Chief
Site Evaluation Unit

Enclosure

JW:jkl

c: Mr. Brian Allen, ESP
Ms. Cherri Baysinger-Daniel, DOH
Mr. Art Busch, DOH
Ms. Cecilia Tapia, EPA
Mr. Kenneth Rapplean, EPA

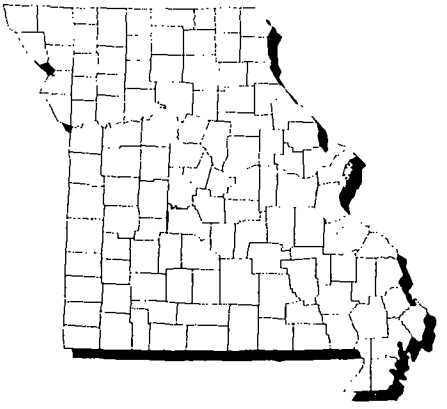
REMOVAL SITE EVALUATION REPORT

HUBERT WHEELER STATE SCHOOL SITE
St. Louis City, Missouri

July 22, 1996

Missouri Department of Natural Resources

Hazardous Waste Program



Prepared By

Julie B. Kelsey
Environmental
Specialist

Reviewed By

Julie Warren
Chief
Site Evaluation Unit

Approved By

Gary T. Behrns
Chief
Superfund Section

Table of Contents

Hubert Wheeler State School Site
Removal Site Evaluation
July 22, 1996

EXECUTIVE SUMMARY

The Hubert Wheeler State School site was reported to the Missouri Department of Natural Resources (DNR) in February of 1993. A black, tar-like substance was reportedly exuding through the asphalt playground used by the students of the school. The Missouri Department of Elementary and Secondary Education (DESE) closed the school on August 12, 1994.

Historical records indicate that this portion of the city of St. Louis was undermined extensively for fire clay. This clay was used in the manufacture of refractory brick, sewer pipe, and other products. The excavated area of the clay mine includes the current day Hubert Wheeler State School property and portions of the surrounding neighborhood. According to area residents and historical records, the excavated area, or pit, was used for waste disposal from the early 1900's through the mid-1960's. Various waste materials were reportedly disposed in the pit, including solid wastes (glass bottles, scrap paper, spoiled food) and hazardous wastes (medical wastes, roofing tar, barrels of tar).

Analytical data from previous soil sampling conducted at the Hubert Wheeler State School site indicate that semi-volatile organic compounds known as polycyclic aromatic hydrocarbons (PAHs) and lead are present in the surface and subsurface soils of the school property. This Removal Site Evaluation (RSE) was performed to determine if the contaminants present in the soils on the school property were also present in the surrounding residential neighborhood. If contamination was found, the next objective was to determine the potential human health risk posed to the residential population.

Sampling and analyses conducted during this RSE indicate that similar PAH compounds and lead are present in the soils in the residential yards. However, there have been no additional reports of free tar. Tar-like materials and/or soil staining were not observed during RSE residential soil sampling.

The analytical data generated from this RSE was provided to the Missouri Department of Health (DOH). The DOH determined that the levels of contamination found in the residential soils are not expected to present an increased risk of non-carcinogenic adverse health effects in humans. The levels of some semi-volatile PAH compounds do pose a slight increased risk of cancer for the residents, assuming lifetime exposure. This risk can be minimized by limiting contact with contaminated soils.

Since the levels of contamination found in the residential yards do not pose an imminent and substantial human health risk, additional removal activities are not recommended for the residential areas.

A public meeting will be held on July 23, 1996, in order to inform the general public about the potential human health risks of lifelong exposure to the contaminated soils. DNR proposes community education to advise the residents of precautions they can take to minimize this possible risk.

Data obtained during the RSE Community Interviews indicates that there may be at least two potential sources of the tar-like material buried on the Hubert Wheeler State School property. Previous geophysical investigations conducted at the school revealed anomalies that would indicate other sources of subsurface contamination.

Additional removal activities are recommended for the school property to locate and remove any source(s) of contamination. The affected substances requiring removal would include any free-product sources, soil, or debris containing hazardous substances in excess of health-based removal goals established for the site.

Hubert Wheeler State School Site
Removal Site Evaluation
July 22, 1996

1.0 INTRODUCTION

This Removal Site Evaluation (RSE) reviews the known contamination issues surrounding the Hubert Wheeler State School property in St. Louis, Missouri, and addresses the potential risk posed to the residential population living near the site. This report was prepared in accordance with 40 CFR 300.410 (Removal Site Evaluation) and additional guidelines provided by the U.S. Environmental Protection Agency (EPA) Region VII.

1.1 Objective of the Removal Site Evaluation

The primary objective of the RSE was to determine whether or not residents living near the Hubert Wheeler State School are at an increased risk of exposure to hazardous substances from the site.

Additional objectives included the following:

- to characterize the hazardous substances within the affected area,
- to determine the source(s) of contamination,
- to delineate site boundaries (both vertical and horizontal),
- to obtain additional information regarding the site history and any potentially responsible parties through community involvement (such as Community Interviews),
- to determine the appropriate action(s) necessary to protect human health and the environment, based upon appropriate health and risk-based criteria.

1.2 Authority for the Work

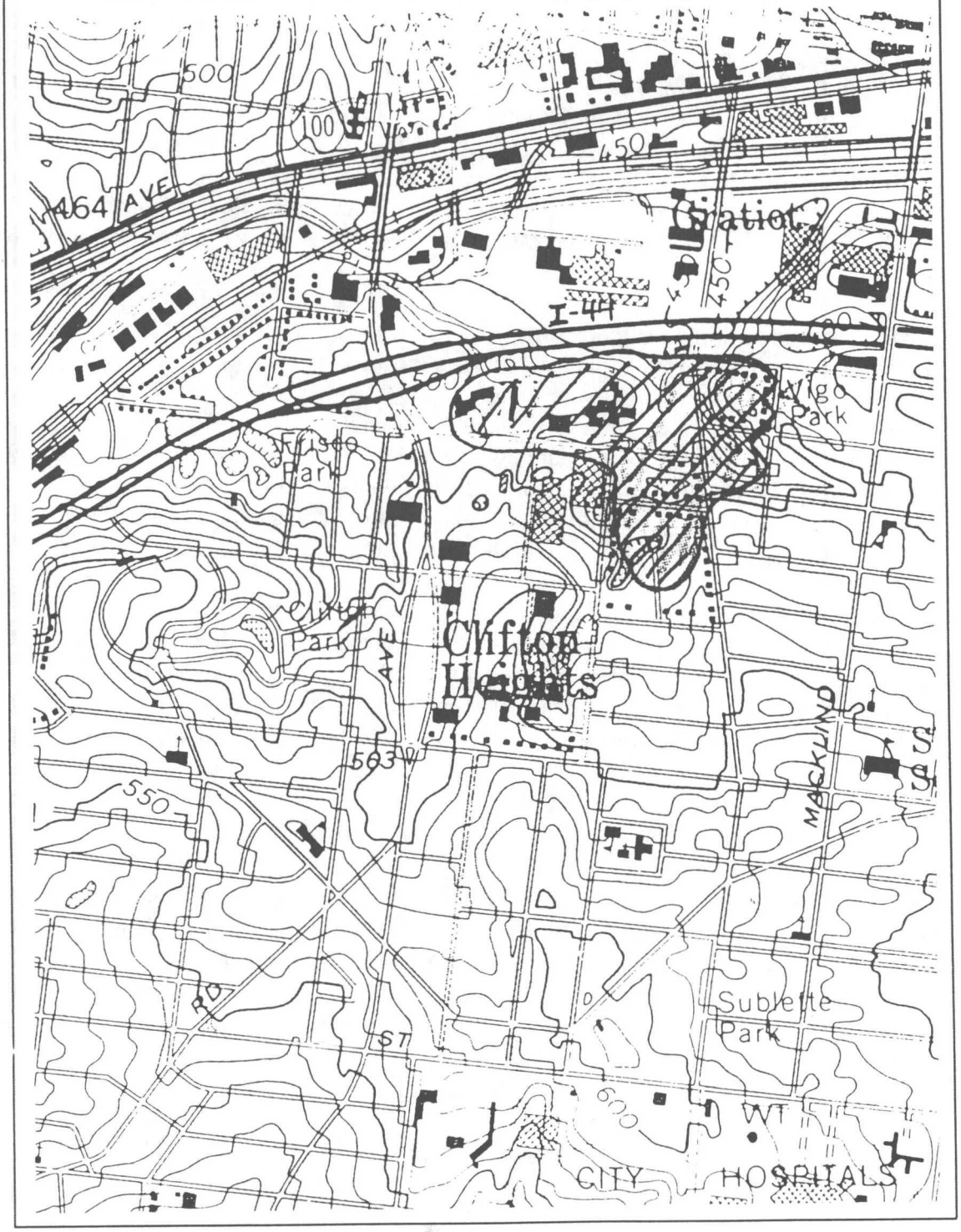
This RSE was performed through a Cooperative Agreement (CA #007587-03) between DNR and EPA Region VII. This report was prepared under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, 42 USC § 9601, et seq.

2.0 SITE CONDITIONS AND BACKGROUND

2.1 Site Location

The Hubert Wheeler State School is located at 5707 Wilson Avenue in St. Louis, Missouri. This location is approximately 10 miles west of downtown St. Louis, in a mixed residential/commercial area about one mile south of Forest Park. If normal survey sections are projected into this area, the location would be in the southern half of section 19, T45N, R7E. The geographic coordinates of the school are 38° 35' 26.76" N latitude and 90° 17' 51.48" W longitude (Figure 1).

Figure 1
Taken from the 1993 Webster Groves 7.5" topographic quadrangle map



2.2 Site Characteristics

The Hubert Wheeler State School was operated by the State of Missouri's Department of Elementary and Secondary Education (DESE) as a state school for severely developmentally disabled students. The school formerly had an enrollment of 110 students and 54 faculty members. Six administrative staff members for the State Schools for the Severely Handicapped also had offices in the building.

The surrounding residential neighborhood is part of a close-knit community, within an area of St. Louis commonly known as "the Hill". Many people within the residential community have lived in this area for their entire lives. Approximately 225 families reside in the surrounding residential neighborhood.

Groundwater in the St. Louis area is highly mineralized and not suitable for drinking water purposes. No drinking water wells are known to be present within four miles of the site. Drainage from the site flows into the River des Peres, a channelized river in the City of St. Louis, and enters the Mississippi River. There are no known drinking water intakes within 15-miles downstream of the school property.

2.3 Contaminants of Concern

The primary contaminants of concern at the Hubert Wheeler State School and surrounding residential properties are lead and several polycyclic aromatic hydrocarbons (PAHs), which are semi-volatile organic compounds. The main semi-volatile compounds found during the PA/SI investigation of the Hubert Wheeler State School property were benzo(a)anthracene, benzo(b)-fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, and chrysene.

Two of the non-PAH semi-volatile compounds detected in the residential soils were 2,4-dinitro-toluene and bis(2-ethylhexyl)phthalate. These compounds are considered by EPA to be probable human carcinogens. Bis(2-ethylhexyl)phthalate is associated with liver tumors; 2,4-dinitrotoluene is associated with kidney tumors. 2,4-Dinitrotoluene is also associated with neurotoxicity.

2.3.1 Lead

Human exposure to lead can have adverse effects on such tissues as the heart, kidneys, lungs and brain. These effects are more striking in children. Nearly all of the lead entering the bloodstream of an adult will move into bones and teeth within a few weeks. About 99% of the lead taken into an adult will leave the body as waste within a couple of weeks. However, in children, 25% of the lead taken into the body remains in the soft tissues and only 32% of the lead leaves the body as waste.

Lead exposure can cause poor growth and decreased mental ability in an unborn child. Similar effects can occur in young children. At high levels of exposure, lead can severely damage the brain and kidneys of both adults and children. Lower levels of lead exposure contribute to slower

reaction time, poor memory, and weakness in the extremities. Some lead compounds may be carcinogenic, but have not been classified as such at this time.

2.3.2 Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are a group of chemicals that are formed during the incomplete burning of coal and other organic substances. There are more than 100 different PAHs. PAHs usually occur naturally, in such compounds as crude oil and coal, but they can also be manufactured as individual compounds for research purposes. A few PAHs are used to prepare medicines, dyes, plastics and pesticides.

Seven of the PAHs detected in the residential soils near the Hubert Wheeler State School are considered by EPA to be probable human carcinogens. These compounds (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene) are associated with skin tumors.

Adverse immunologic effects have been reported from PAH exposure in animals. At least five of the PAH compounds detected in the residential soils near the Hubert Wheeler State School are associated with noncarcinogenic toxicity in humans: acenaphthalene (hepatotoxicity), di-n-butylphthalate (increased mortality), fluoranthene (adverse effects to liver), fluorene (adverse effects to blood), and pyrene (adverse effects to kidneys).

2.4 Current Status of the Site

The Hubert Wheeler State School site is listed in EPA's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) with a discovery date of February 2, 1993. The CERCLIS completion date for the Preliminary Assessment (PA) is August 5, 1994; the Site Inspection (SI) completion date is listed as September 29, 1994. Both documents are listed as giving the site a "higher priority" designation.

In 1993, DESE hired a contractor, Geotechnology, Inc., to investigate the site. Geotechnology has conducted several extensive investigations of the school property, including soil borings and monitoring well installations and several subsurface investigations, such as an infrared thermography (IR) scan and an electromagnetic radiation survey.

DESE has closed the Hubert Wheeler State School and relocated the former students and teachers to a temporary location. Funding for a new school building was requested from the Missouri General Assembly during the 1996 legislative session.

The Hubert Wheeler State School building is currently vacant. There are signs posted around the perimeter of the property warning that it is a "potentially contaminated area". The former asphalt playground, where the tar seep is located, is surrounded by a chain-link fence.

3.0 SITE HISTORY

Clay mining was conducted in this part of St. Louis City earlier in the 20th century. The Laclede Christy Clay Products Clay Mine was present on both the 1903 and 1926 Sanborn maps near the Hampton/Wilson Avenue intersection. A chain-of-title search was prepared for the Hubert Wheeler State School property by Geotechnology, Inc. The findings of this search indicate that from 1907 to 1959, site ownership included the Laclede Fire Brick Manufacturing Company, the Laclede-Christy Company, and the H.K. Porter Company (which is now the Quaker Rubber Corporation). Building and occupancy permits indicate that from 1950 to 1967, warehouse facilities were used by the St. Louis Coke & Foundry Supply as a storage area. The coke and foundry supply constructed a warehouse in 1960 to store varnish makers' and painters' naphtha (VMP naphtha).

A large area of excavation, most likely from subsurface clay mining activities, existed in the vicinity of the school and neighboring properties. This pit was reportedly operated as a dump, and was used for general landfilling by the neighborhood residents, several local businesses, and a nearby hospital. Once the former pit areas were filled in, the land was apparently divided for development. A portion of the former pit area was purchased by the State of Missouri in 1968. The Hubert Wheeler State School was opened in 1970.

DNR became involved with the Hubert Wheeler School site in February 1993. Geotechnology, Inc., DESE's consultant, notified DNR of a black material "oozing" through the asphalt playground at the school. In December 1993, in concurrence with the Missouri Department of Health (DOH), DNR recommended that access to the playground restricted. DESE subsequently erected a fence around the asphalt playground.

In August 1994, DESE decided to close the school pending further sampling and analyses. Based on the results of an additional site assessment, completed by Geotechnology in September 1995, DESE decided to permanently relocate the Hubert Wheeler students to another facility.

3.1 Previous Site Investigations

3.1.1 DNR Preliminary Assessment/Site Inspection (PA/SI)

DNR completed a Preliminary Assessment (PA) report dated January 7, 1994. Further investigation was recommended. The Site Inspection (SI) report, dated September 20, 1994, concluded that further actions, including an Expanded Site Inspection and/or a removal action, may be warranted at the site.

DNR conducted sampling at the Hubert Wheeler State School site on July 7, 1994, as part of the SI. Six grab samples were collected from the top two feet of soil. Four samples were collected in the vicinity of the asphalt playground on the western side of the school and two were collected from the eastern side of the school. A sample of the tar-like material was also collected.

The sample of tar-like material had high levels (exceeding 1,000 ppm) of 17 PAH compounds. The level of benzo(a)pyrene, a probable human carcinogen, was 32,000 ppm. Detectable levels of benzo(a)anthracene, chrysene, fluoranthene, phenanthrene and pyrene were found in all six soil samples. One of the soil samples, collected nine feet west of the asphalt playground, exceeded three times the background sample. This sample also exceeded the PA/SI health-based site screening standard for benzo(a)pyrene (0.08 ppm).

DNR staff attended two public meetings regarding the Hubert Wheeler State School site during the PA/SI investigation. During the September 21, 1994 meeting, former teachers of the Hubert Wheeler State School reported that both teachers and students had direct contact with the tar-like material. They also said that the tar-like substance would emerge through the cracks in the concrete every spring since the school opened. The tar-like material was chipped off and removed by school staff in the winter.

In 1990, DESE staff used a backhoe to excavate an area next to the asphalt playground, with the purpose of determining the depth and extent of the subsurface material and permanently removing the tar. According to DESE file records, a horizontal vein of coal tar was reportedly observed at a depth of four feet. The material, which was moving parallel to the soil surface, was said to be approximately eight feet wide and nine inches thick. DESE installed a concrete walkway over this area in 1990. At least one 55-gallon drum was unearthed during these activities.

3.1.2 State of Missouri Investigation

Geotechnology completed ten subsurface borings in the Hubert Wheeler State School's asphalt playground area in August 1993. The report of this investigation was completed November 30, 1993. Contamination with semi-volatile organic constituents (like those found in coal-tar) and lead were detected. The source and full extent of contamination were not determined during this investigation.

Surficial soil sampling was conducted by Geotechnology in July 1994, in conjunction with the DNR PA/SI sampling. A total of ten composite soil samples, collected from areas outside of the fenced asphalt playground, were taken from the 0-6 inch depth. The analytical results for the soils were similar to the results reported by DNR.

Geotechnology conducted several non-intrusive site assessment activities including magnetometer, infrared thermographic, and ground penetrating radar surveys. The results of these surveys indicate that anomalies are present beneath the school property. These anomalies may indicate the presence of buried materials.

At DESE's request, an additional site assessment was conducted by Geotechnology in 1995. Field work was completed in July 1995, and the report of this work was dated September 7, 1995. This investigation included surface soil sampling, several additional soil borings and installation of three groundwater monitoring wells across the entire property. Contamination with semi-volatile organic constituents and lead was found to extend across the entire property, up to the property boundaries.

3.1.3 Extent of Contamination Within School Property Boundaries

Contamination has been detected across the Hubert Wheeler State School property at depths exceeding 15 feet. The greatest levels of contamination appear to be associated with non-native soil, most likely fill material from prior landfilling activities. Contamination appears to increase with depth.

3.2 Data Obtained During the Removal Site Evaluation

3.2.1 Community Interviews

On February 28-29, 1996, the Missouri Department of Natural Resources (DNR) and the Missouri Department of Health (DOH) conducted community interviews near the Hubert Wheeler State School site. Thirteen residents, representing eight families, were interviewed. DNR staff also researched the area surrounding the Hubert Wheeler State School site at the St. Louis public library. Copies of historical information, the Community Interview form, and a summary of the data obtained from the Community Interviews are presented within the Phase 1 Work Plan (attached).

Several residents expressed their feelings of loss over the closure of the Hubert Wheeler State School. Some were concerned about the future use of the property, and hoped the building could re-open. The Hill 2000, a civic organization, was described by many as a group that unites the community. This group may be an appropriate point of contact for future public outreach. They also may have important historical information of this area, such as archived photographs, which may aid in future investigations.

3.2.1.1 Laclede-Christy Mining Activities

In the past, the River des Peres ran freely through the Hubert Wheeler School property. During the early 1900's, this river was rechanneled to the north, into its current configuration. Laclede-Christy subsequently operated a clay mine near the current Hubert Wheeler State School property.

Mine shafts are located throughout the area. One resident remembered that Laclede-Christy had a small train which ran from this mine shaft to the southern portion of the clay mine at the intersection of Fyler and Macklind Avenues. Other clay mine shafts are reportedly located near Dempsey Avenue and the intersection of 59th Street and Elizabeth. Some of the clay mine shafts were reportedly 100-200 feet deep.

3.2.1.2 Post-Mining Site Conditions

After Laclede-Christy had mined the area, a gully 10-feet in depth washed materials from the present Hubert Wheeler property north to the River des Peres. A pond, fed by a spring and/or a small tributary of River des Peres, formed near Macklind and Sublette Avenues. The water was said to be deep enough for local children to wade in the water. Reportedly, this lake was filled in when the school was built in 1968 by the Schnurr Construction Company. The Schnurr Construction Company was said to have brought in dirt and placed drains so that standing water on the school property would drain north to River des Peres.

Upon closure of the clay mine, water was reportedly pumped into a mine shaft located less than 0.25 miles west of the Hubert Wheeler State School property (near the Red Roof Inn and Holiday Inn).

3.2.1.3 Formation of the "Pit" Area and Subsequent Landfilling Operations

As a result of the mining activities, which included Laclede-Christy piling clay in 30-40 foot piles, a pit area was formed. The former pit area is known to have been filled in with waste materials. The affected area ranges roughly from Macklind Avenue on the east to Hampton Avenue on the west, and from I-44 on the north to Stephens Court (off Elizabeth Street) on the south. One resident reported dump areas as far south as the intersection of January and Columbia Avenues; another said there was a dump at Fyler and Jasper Park, with fill on the south side of Fyler.

The size and scope of the clay mine pit are supported by two historical documents, an adaptation of a hand-drawn map from 1923 and a newspaper photo from 1949. Based upon this information, using the current topographic map, the clay mined area was approximately 20 to 30 acres in size.

Several residents said that the overall pit area was operated as a dump. Separate portions of this pit area were operated as smaller dumps by different people. One dump was said to have been located near the intersection of Macklind and Daggett Avenues (where Berra Park is today), with the entrance on Macklind, and the other between Sublette and January Avenues, with the entrance on Sublette.

Two residents reported that the dumped wastes in the pit were always smoldering, or that fires burned frequently. The fire department was often called to address the fires, prior to the installation of I-44 (about 1970). Two residents reported that children were burned by the hot ashes. One of these incidents was said to have occurred in the mid-1960's.

Many residents described playing in the dump as children. They were able to recall a variety of waste materials, including the following: cinders, ash, bottles, medical waste (prescription bottles, blue Phillips milk of magnesia bottles, vials, X-rays, casts), bleach bottles, brick, glass, cans, truckloads of dirt, refractory materials, fire brick, pieces of tile, straw, a pile of plastic/wooden heels from a shoe factory, and "anything mis-manufactured".

Twelve to eighteen full 55-gallon drums of tar were reportedly buried on the Hubert Wheeler State School property. The suspected location of burial is east and north of the present school buildings, at a depth of 25 feet. This was thought to have occurred around 1932. One resident said that tar was used to roof the school. During the construction of the school, trucks reportedly dumped materials at the request of the school developer. It is thought that tar may have been buried on-site between 1968 and 1970.

A portion of the pit area was reportedly filled in as part of the construction of the Hubert Wheeler State School. Dirt, waste concrete, and at least 10 feet of fill were introduced to the site on two separate occasions. This fill material was then compacted and more dirt was introduced. This resident described the school as having been placed on "concrete floating footings". The floating footings were used so that if one part of the school were to sink into the fill, the rest of the structure would absorb the impact and sink as well.

It has been estimated, by one resident, that 30-35 feet of fill underlie Wilson Avenue, with 12-15 feet of that as cinders. According to another resident, up to 50 feet of fill may be present beneath the residential area near Stephens Court.

3.2.1.4 Potentially Responsible Parties

Laclede-Christy operated the clay mine and produced fire bricks. Reportedly, no hazardous wastes were generated by Laclede-Christy. After the clay mine ceased operation, several people operated portions of the pit as dumps: Bill Brandhardt (deceased), who handled "Brandhardt's Dump" at Macklind and Daggett Avenues in the 1930s; C. Rallo Construction (also referred to as C. Rallo Contracting), the company that reportedly paved Wilson Avenue; Marnotti's; and Marcelle, a man who reportedly lived on Dempsey Avenue in the 1930's. The dump operators were said to have collected fees from the dump trucks. The dump trucks reportedly paid by the load.

Carondelet Foundry reportedly had a contract with Marnotti's to fill in portions of the pit area with molding sand. The following companies also reportedly deposited wastes in the clay pit: American Stove (porcelain fragments), Pearlite Pre-Castings (sweepings), Blackburn-Post Pipe Company (partially burned coal), and a nearby hospital (medical waste). Other companies that historically operated near the current Hubert Wheeler State School property include Evans & Howard, McQuay-Norris, St. Louis Brick Company, Banner Iron Works, National Lead, and Scullins Steel.

3.2.2 Removal Site Evaluation Sampling

On March 4-5, 1996, DNR staff conducted Removal Site Evaluation sampling in the residential and commercial areas surrounding the Hubert Wheeler State School site. Samples were collected from properties suspected to have the highest levels of contamination, based upon historical and current information about the area. These locations included properties nearest to the Hubert Wheeler State School, and along Wilson Avenue and Berra Court.

Soil composite samples were collected from the 0-6 inch depth from 22 residential properties. The surficial soil samples (22 samples and 2 duplicates) were collected from the following locations: Wilson Avenue (13 homes), Bischoff (4 homes), Daggett (2 homes), Berra Court (2 homes) and Sublette (1 home).

Each composite sample consisted of five separate aliquots collected from both the front and back yards of the residences. The aliquots for the composite samples were collected using either a clean stainless steel spoon or a clean or field decontaminated stainless steel trowel.

Six subsurface soil samples (5 locations and one duplicate) were collected. Three subsurface soil samples (2 samples and 1 duplicate) were collected from two commercial properties. One commercial property is located west of the Hubert Wheeler State School, the other is located south. The remaining three subsurface samples were taken from residential locations south and east of the school. The residential subsurface samples were taken from the following locations: the Berra Court cul-de-sac, Daggett Avenue, and Bischoff Avenue.

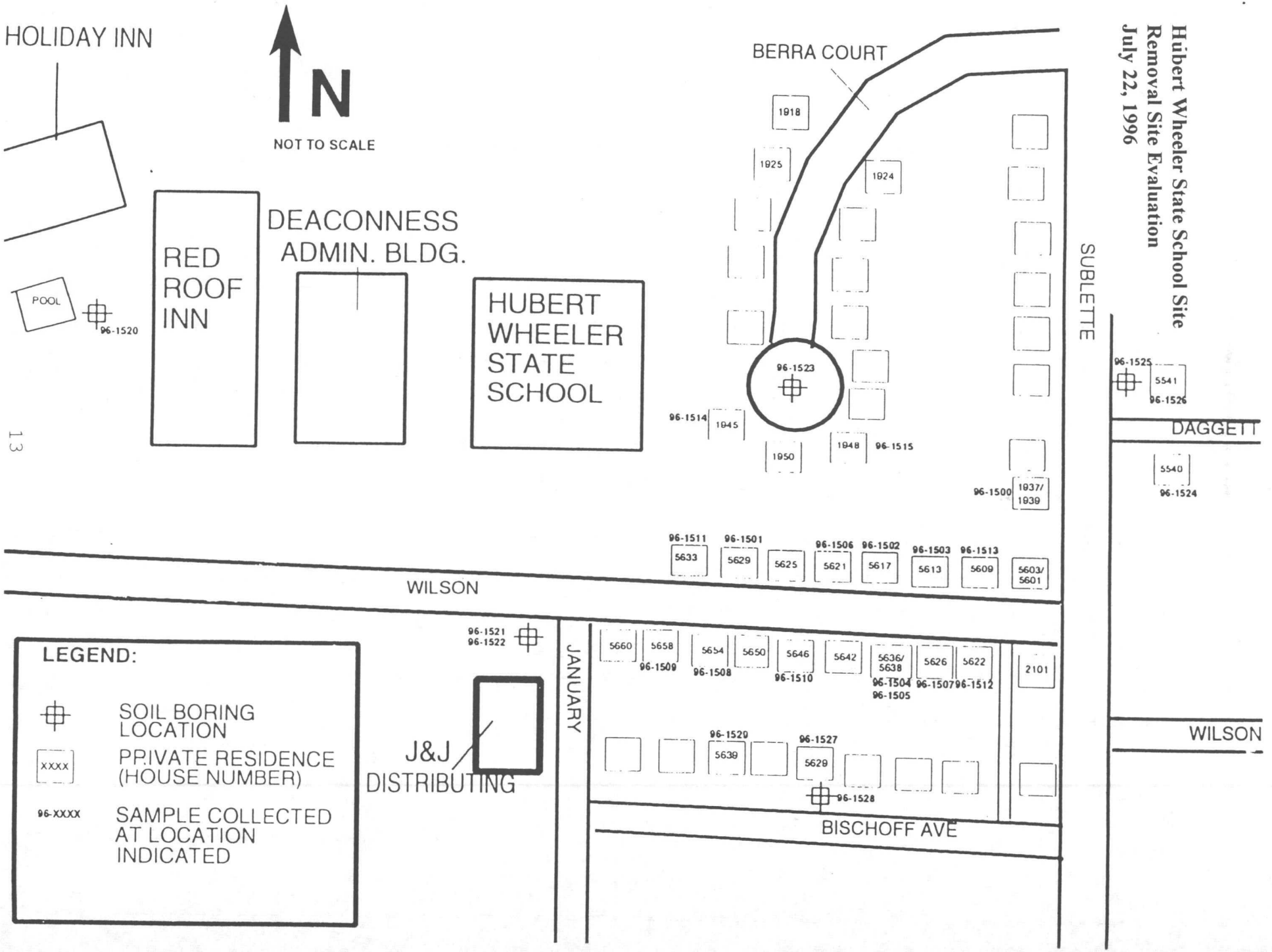
Subsurface soil grab samples were collected from approximately 4-6 feet in depth from two commercial and three residential locations. All subsurface samples were collected with a hydraulic soil probe.

All samples were analyzed for base-neutral (semi-volatile) organic compounds, including PAHs, and lead. Sampling locations are presented in Figure 2.

3.2.3 Removal Site Evaluation Findings

In reviewing all of the sampling data collected for the Removal Site Evaluation, 19 PAH compounds, 2,4-dinitrotoluene, and lead were the analytes detected. Of these substances, lead, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and dibenz(a,h)anthracene were detected at levels exceeding the DOH Any-Use Soil Levels. Sampling data are presented in Table 1 (a-c) and Table 2.

Figure 2
Taken from the Phase I Removal Assessment Sampling Report



Hubert Wheeler State School Site
Removal Site Evaluation
July 22, 1996

Table 1a. Hubert Wheeler State School Site
Removal Site Evaluation - Surficial Soil Samples (0-6" depth)
All values in parts per million (ppm)

Parameters	1996 DOH ASL	96-1500 1937-1939 Sublette	96-1501 5629 Wilson	96-1502 5617 Wilson	96-1503 5613 Wilson	96-1504 5636 Wilson	96-1505 5636 Wilson duplicate	96-1506 5621 Wilson	96-1507 5626 Wilson	96-1508 5624 Wilson	96-1509 5658 Wilson
Lead	240	353[A]	223	200	190	215	211	532[A]	392[A]	161	177
Naphthalene	230	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.17	0.13	<0.1	<0.1
Acenaphthylene	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	3,400	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	0.13	<0.1	<0.1
Dibenzofuran	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	0.10	<0.1	<0.1
2,4-Dinitrotoluene	11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.15	0.13	<0.1	<0.1
Fluorene	2,300	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.14	0.12	<0.1	<0.1
Phenanthrene	N/A	1.30	0.46	1.10	0.12	0.17	0.15	2.30	2.10	0.62	0.27
Anthrancene	17,000	0.17	<0.1	0.19	<0.1	<0.1	<0.1	0.46	0.41	0.17	<0.1
Di-n-Butylphthalate	N/A	1.40	3.60	2.60	2.10	1.10	2.90	2.20	3.50	1.90	1.50
Fluoranthene	2,300	2.20	0.64	1.10	0.17	0.26	0.27	2.60	1.60	1.40	0.55
Pyrene	1,700	1.50	0.47	1.10	0.12	0.23	0.17	2.20	1.60	2.20	0.61
Benzo(a)anthracene	4.5	0.94	0.27	0.45	<0.1	0.15	0.13	1.30	0.80	1.10	0.38
Chrysene	160	0.91	0.28	0.49	<0.1	0.13	0.12	1.00	0.66	0.96	0.37
Bis(2-ethylhexyl) phthalate	100	0.24	0.20	0.37	0.16	0.18	0.23	0.19	0.17	<0.1	<0.1
Benzo(b)fluoranthene	4.0	1.40	0.39	0.55	0.104	0.30	0.36	1.40	0.94	0.74	0.37
Benzo(k)fluoranthene	34	0.46	0.16	0.24	<0.1	<0.1	<0.1	0.43	0.34	0.28	0.13
Benzo(a)pyrene	0.68	0.79[A]	0.24	0.49	<0.1	0.15	0.16	1.10[A]	0.72[A]	0.58	0.31
Indeno(1,2,3-cd)pyrene	12	0.78	0.26	0.39	<0.1	0.13	0.17	0.82	0.42	0.35	0.26
Dibenz(a,h)anthracene	0.62	0.31	<0.1	<0.1	<0.1	<0.1	<0.1	0.26	0.14	<0.1	<0.1
Benzo(g,h,i)perylene	N/A	0.88	0.30	0.49	<0.1	0.14	0.16	0.92	0.60	0.59	<0.1

Shaded values exceed Missouri Department of Health Any-Use Soil Levels (ASLs). If ASLs are not available, they are listed as N/A.

Table 1b. Hubert Wheeler State School Site (Continued)
Removal Site Evaluation - Surficial Soil Samples (0-6" depth)
All values in parts per million (ppm)

Parameters	1996 DOH ASL	96-1510 5646 Wilson	96-1511 5633 Wilson	96-1512 5622 Wilson	96-1513 5609 Wilson	96-1514 1945 Berra Court	96-1515 1948 Berra Court	96-1516 5234 Bischoff	96-1517 5234 Bischoff Duplicate	96-1518 5238 Bischoff	96-1519 5320 Wilson
Lead	240	292[A]	160	234	147	227	41.8	533[A]	265[A]	361[A]	216
Naphthalene	230	<0.1	<0.1	<0.5	0.104	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	N/A	<0.1	<0.1	<0.5	0.103	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	3,400	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzofuran	N/A	<0.1	<0.1	<0.5	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4-Dinitrotoluene	11	<0.1	<0.1	<0.5	0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	2,300	<0.1	<0.1	<0.5	0.14	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	<0.1	0.68	0.16	<0.5	2.40	0.27	0.60	2.40	1.10	0.24	0.76
Anthrancene	17,000	0.19	<0.1	<0.5	0.53	<0.1	0.14	0.27	0.23	<0.1	0.13
Di-n-Butylphthalate	N/A	1.50	0.72	1.10	0.76	0.76	0.75	2.10	<0.1	<0.1	2.50
Fluoranthene	2,300	1.10	0.36	<0.5	4.00	0.46	1.20	3.10	2.90	0.61	1.50
Pyrene	1,700	1.40	0.42	0.58	5.00	0.60	1.60	0.82	0.69	0.19	0.39
Benzo(a)anthracene	4.5	0.80	0.29	<0.5	3.00	0.42	0.70	1.00	0.88	0.26	0.45
Chrysene	160	0.63	0.25	0.48⊙	2.20	0.32	0.61	0.59	0.57	0.24	0.28
Bis(2-ethylhexyl)phthalate	100	0.19	<0.1	<0.5	0.102	0.57	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	4.0	0.60	0.23	<0.5	2.10	0.28	0.58	0.99	0.90	0.42	0.43
Benzo(k)fluoranthene	34	0.16	0.11	<0.5	0.57	0.14	0.24	0.33	0.24	0.16	0.13
Benzo(a)pyrene	0.68	0.40	0.18	<0.5	1.40[A]	0.25	0.38	0.72[A]	0.67	0.25	0.33
Indeno(1,2,3-cd)pyrene	12	0.39	0.15	<0.5	1.40	<0.1	<0.1	0.86	0.88	0.59	0.49
Dibenz(a,h)anthracene	0.62	0.13	<0.1	<0.5	0.37	<0.1	<0.1	0.28*	0.44*	0.34*	0.24*
Benzo(g,h,i)perylene	N/A	0.44	0.16	<0.5	1.50	<0.1	0.50	1.00*	<0.1	0.67*	0.57*

[A] = Shaded values exceed Missouri Department of Health Any-Use Soil Levels (ASLs). If ASLs are not available, they are listed as N/A; ⊙ = below detection limit; * = approximate value

Table 1c. Hubert Wheeler State School Site (Continued)
Removal Site Evaluation - Surficial Soil Samples (0-6" depth)
All values in parts per million (ppm)

Parameters	1996 DOH ASL	96-1524 5540 Daggett	96-1526 5541 Daggett	96-1527 5629 Bischoff	96-1529 5639 Bischoff
Lead	240	348[A]	185	233	252[A]
Naphthalene	230	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	N/A	<0.1	<0.1	<0.1	<0.1
Acenaphthene	3,400	<0.1	<0.1	<0.1	<0.1
Dibenzofuran	N/A	<0.1	<0.1	<0.1	<0.1
2,4-Dinitrotoluene	11	<0.1	<0.1	<0.1	<0.1
Fluorene	2,300	<0.1	<0.1	<0.1	<0.1
Phenanthrene	N/A	1.60	0.14	0.60	0.54
Anthracene	17,000	0.22	<0.1	0.13	0.12
Di-n-Butylphthalate	N/A	1.10	1.60	5.70	2.00
Fluoranthene	2,300	4.60	0.30	1.10	1.20
Pyrene	1,700	1.70	<0.1	0.40	0.46
Benzo(a)anthracene	4.5	1.80	0.11	0.49	0.58
Chrysene	160	1.30	0.13	0.32	0.42
Bis(2-ethylhexyl)phthalate	100	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	4.0	1.70	0.12	0.54	0.56
Benzo(k)fluoranthene	34	0.41	<0.1	0.14	0.19
Benzo(a)pyrene	0.68	1.20[A]	0.11	0.38	0.38
Indeno(1,2,3-cd)pyrene	12	1.50	0.14	0.44	0.42
Dibenz(a,h)anthracene	0.62	0.89	<0.1	0.17 *	0.20
Benzo(g,h,i)perylene	N/A	1.60	0.16	0.47 *	0.56

[A] = Shaded values exceed Missouri Department of Health Any-Use Soil Levels (ASLs).
If ASLs are not available, they are listed as N/A; * = approximate value

Hubert Wheeler State School Site
Removal Site Evaluation
July 22, 1996

Table 2. Hubert Wheeler State School Site
Removal Site Evaluation - Subsurface Soil Samples (4-6' depth)
All values in parts per million (ppm)

Parameters	1996 DOH ASL	96-1520 Holiday Inn	96-1521 J & J Distributors	96-1522 J & J Dist. Duplicate	96-1523 Berra Court Cul-de-Sac	96-1525 5541 Daggett	96-1528 5629 Bischoff
Lead	240	173	34.9	40.0	1,060[A]	482[A]	1,130[A]
Naphthalene	230	<0.1	<0.1	<0.1	<0.5	<0.1	<1.0
Acenaphthylene	N/A	<0.1	<0.1	<0.1	<0.5	<0.1	<1.0
Acenaphthene	3,400	<0.1	<0.1	<0.1	<0.5	<0.1	1.60
Dibenzofuran	N/A	<0.1	<0.1	<0.1	<0.5	<0.1	1.10
2,4-Dinitrotoluene	11	<0.1	<0.1	<0.1	<0.5	<0.1	1.80
Fluorene	2,300	<0.1	<0.1	<0.1	<0.5	<0.1	1.60
Phenanthrene	N/A	<0.1	<0.1	<0.1	1.50	0.12	29.00
Anthracene	17,000	<0.1	<0.1	<0.1	<0.5	<0.1	5.10
Di-n-Butylphthalate	N/A	<0.1	<0.1	1.50	2.40	7.80	3.80
Fluoranthene	2,300	<0.1	<0.1	0.102	0.94	0.22	49.00
Pyrene	1,700	<0.1	<0.1	<0.1	<0.5	<0.1	21.00
Benzo(a)anthracene	4.5	<0.1	<0.1	<0.1	0.52	0.11	15.00[A]
Chrysene	160	<0.1	<0.1	<0.1	0.94	<0.1	12.00
Bis(2-ethylhexyl)phthalate	100	<0.1	<0.1	<0.1	<0.5	<0.1	<1.0
Benzo(b)fluoranthene	4.0	<0.1	<0.1	<0.1	1.00	0.16	16.00[A]
Benzo(k)fluoranthene	34	<0.1	<0.1	<0.1	<0.5	<0.1	3.80
Benzo(a)pyrene	0.68	<0.1	<0.1	<0.1	0.52	0.13	12.00[A]
Indeno(1,2,3-cd)pyrene	12	<0.1	<0.1	<0.1	0.88	0.106	14.00[A]
Dibenz(a,h)anthracene	0.62	<0.1	<0.1	<0.1	<0.5	<0.1	3.40[A]
Benzo(g,h,i)perylene	N/A	<0.1	<0.1	<0.1	0.94	0.12	16.00

[A] = Shaded values exceed Missouri Department of Health Any-Use Soil Levels (ASLs).
If ASLs are not available, they are listed as N/A

Of the 24 residential soil samples collected from surficial soils, 10 samples were found to contain hazardous substances at levels exceeding the ASLs for lead (240 parts per million or ppm), benzo(a)pyrene (0.68 ppm), and dibenz(a,h)anthracene (0.62 ppm). Nine samples had elevated lead levels , ranging from 252 ppm to 533 ppm. Six samples had elevated levels of benzo(a)pyrene, ranging from 0.72 ppm to 1.4 ppm. One sample had an elevated level of dibenz(a,h)anthracene (0.89 ppm).

The subsurface samples collected from the commercial properties did not contain any hazardous substances above the ASLs. All three of the subsurface residential samples showed levels of lead elevated above the ASL. The values ranged from 482 ppm to 1,130 ppm. One of these samples also had five PAHs that were elevated above ASLs: benzo(a)anthracene (15 ppm; ASL is 4.5 ppm), benzo(b)fluoranthene (16 ppm, ASL is 4.0 ppm), benzo(a)pyrene (12 ppm, ASL is 0.68 ppm), indeno(1,2,3-cd)pyrene (14 ppm, ASL is 12.0 ppm), and dibenz(a,h)-anthracene (3.4 ppm, ASL is 0.62 ppm).

4.0 POTENTIAL THREAT TO PUBLIC HEALTH AND WELFARE

All of the residents participating in the Community Interviews were aware that their homes were constructed on or near a former waste disposal area. Many residents have found ash, cinders, and glass bottles in the subsurface soil in their yards.

Some of the residents have vegetable gardens. At least one resident, knowing of the fill material, has an elevated garden. Although most residential yards are well-maintained, at least one resident has expressed difficulty in maintaining a healthy grass lawn.

4.1 Health Consultation

DOH, in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), prepared a Health Consultation for the residential areas surrounding the Hubert Wheeler State School. This report concluded that residents may be exposed to low levels of PAHs or lead when they work or play in the contaminated soils. Adverse health effects are not expected to occur, assuming the residents spend a limited amount of time in contact with the soils. Bioaccumulation of PAHs in garden produce is presented as a potential exposure route.

The Health Consultation recommends that residents avoid exposure to contaminated soils by maintaining a layer of topsoil and a healthy vegetative cover (grass). Residents are advised to prevent children (ages 6 months to 6 years) from exposure to contaminated soils, due to lead levels exceeding the DOH ASL for lead. Raised bed gardens, filled with clean top soil, are proposed as a means of limiting potential exposure to PAHs from ingestion of vegetables grown in the contaminated fill material.

4.2 Expedited Risk Assessment

DNR staff requested the DOH prepare an expedited risk assessment. This document was used to assess the potential risk of adverse health effects posed by contaminated residential soils in the vicinity of the Hubert Wheeler State School site. To evaluate the risk posed by hazardous substances, risk evaluators estimate the potential human exposure to the substances over a period of time. Available toxicity data for the hazardous substances is used to assess this risk

Noncarcinogenic human health effects posed to the residents by exposure to contaminated surficial soils near the site were assessed using a hazard index approach. The highest values detected in the surficial residential soils were used. To prepare the hazard index, a calculated intake of each chemical was developed (for substances that were detected in the residential soils and for which applicable health data is available). The intake value for each chemical is then compared to the reference dose. The final value, the hazard index, is a summation of all of the hazard quotients. A calculated value exceeding 1.0 indicates an increased health risk is likely.

Based upon a 30-year residential exposure, the calculated value for the surficial residential soils near the Hubert Wheeler State School site was 0.00035, which is substantially less than one. Based upon this information, non-carcinogenic adverse health effects from the Hubert Wheeler State School site would not be expected to occur.

Excess lifetime cancer risks were evaluated for individual carcinogenic compounds in the soil. A summation of these risks was then prepared. This calculated value, assuming a 30-year residential exposure to contaminated surficial soils, was 6.9×10^{-6} (or 6.9 potential excess cases of cancer in 1,000,000 people). While this value exceeds the 1×10^{-6} cancer risk (the level at which EPA considers a site to pose negligible risk) it does not exceed the 1×10^{-4} cancer risk at which EPA would require the site to be remediated.

4.3 Preliminary Removal Goals

Preliminary Removal Goals (PRGs) are risk-based values which provide an assessment of the risk to human health and the environment over a reasonable maximum exposure time. PRGs are generally developed during the course of a Removal Action and may be used later as site specific cleanup standards.

The PRGs developed for the Hubert Wheeler State School residential area were prepared by DOH. DNR staff used these values to determine if the concentrations of hazardous substances detected in residential areas warrant a removal action.

PRGs were calculated for the Hubert Wheeler State School at three risk levels: 1×10^{-4}, 1×10^{-5}, and 1×10^{-6}. These values correspond to a potential increased risk of exposure to site related contaminants. In quantitative terms, risk is expressed in values ranging from zero (no possibility of harm) to one (a certainty that harm will occur). For example, a 1×10^{-4} risk level means that

there is a potential increased risk of exposure for one person out of 10,000 people. This risk level is commonly used by EPA to trigger remedial actions at Superfund sites.

The PRGs which were developed for the residential area near the Hubert Wheeler State School are presented in Table 3. The highest concentrations of PAHs and lead detected during Removal Site Evaluation sampling are provided for comparison purposes. Surficial soils (collected from the 0-6 inch depth) and subsurface soils (collected from the 4-6 foot depth) were evaluated separately

Using the highest values detected for each type of sample collected (surficial or subsurface), four PAH compounds exceeded the 1×10^{-6} risk level for surficial samples. These compounds were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene. No surficial soil sampling values exceeded the 1×10^{-5} or 1×10^{-4} risk levels. The same PAH compounds were detected at levels exceeding the 1×10^{-6} risk level for subsurface samples. In addition, indeno(1,2,3-cd)pyrene exceeded the 1×10^{-6} risk level and benzo(a)pyrene and dibenz(a,h)-anthracene exceeded the 1×10^{-5} risk level.

Based upon EPA guidance, the soil screening level for lead is 400 ppm The highest values for lead in residential soils, both surficial (533 ppm) and subsurface (1,130 ppm), exceeded this value.

4.4 Applicable, Relevant, and Appropriate Requirements (ARARs)

Concentrations of hazardous substances in the residential soils were compared to DOH's Any-Use Soil Levels (ASLs). These are the levels which DOH considers to be safe for any use, assuming a lifetime exposure. The DOH ASLs are to be considered when deciding upon removal action levels. However, since they are not promulgated, they are not ARARs. Action-specific, location-specific, and chemical-specific ARARs will need to be developed to address future removal activities at the school property.

5.0 PROPOSED ACTION

5.1 Proposed Activities

The human health risk posed by the contamination within the residential soils near the Hubert Wheeler State School site is considered to be minimal. Community education is proposed as a means to inform the public about the State of Missouri's investigations within the residential community near the Hubert Wheeler State School. Recommendations and suggested actions to minimize exposure to the contaminated soils should be included, so that the public may make informed decisions about ways to limit their potential risk of exposure.

Table 3. Preliminary Removal Goals (PRGs)
for the Residential Yards near the Hubert Wheeler State School
All values in parts per million (ppm).

Contaminants found in residential yards	Highest value in residential soils (top six inches)	Highest value in residential soils (four to six feet)	PRGs at 1 x 10^{-4} risk level - Removal action may be conducted	PRGs at 1 x 10^{-5} risk level - Removal action may be needed	PRGs at 1 x 10^{-6} risk level Removal action may be considered
2,4-Dinitrotoluene	0.15	1.8	180	18	1.8
Acenaphthene	0.13	1.6	31,000	15,000	3,100
Acenaphthylene	0.103	ND	N/A	N/A	N/A
Anthracene	0.53	5.1	150,000	77,000	15,000
Benzo(a)anthracene	3.0[A]	15.0[A]	160	16	1.6
Benzo(a)pyrene	1.4[A]	**12.0**[A,B]	16	1.64	0.16
Benzo(b)fluoranthene	2.1[A]	16[A]	160	16	1.6
Benzo(g,h,i)perylene	1.6	16	N/A	N/A	N/A
Benzo(k)fluoranthene	0.57	3.8	1,600	160	16
Bis(2-ethylhexyl)phthalate	0.57	ND	1,200	750	12
Chrysene	2.2	12.0	16,000	1,600	160
Di-n-butyl phthalate	5.7	7.8	51,000	26,000	5,100
Dibenz(a,h)anthracene	0.89[A]	**3.4**[A,B]	16.0	1.6	0.16
Dibenzofuran	0.13	1.1	N/A	N/A	N/A
Fluoranthene	4.6	49.0	21,000	10,000	2,100
Fluorene	0.14	1.6	21,000	10,000	2,100
Indeno(1,2,3-cd pyrene	1.5	14.0[A]	160	16	1.6
Naphthalene	0.17	ND	21,000	10,000	2,100
Phenanthrene	2.4	29.0	N/A	N/A	N/A
Pyrene	5.0	21.0	15,000	7,700	1,500
Lead	*533*[C]	*1130*[C]	PRG = 400 ppm, based upon an EPA model		

[A]= Shaded values exceed the 1 x 10^{-6} risk level; [B] = Values in bold exceed the 1 x 10^{-5} risk level.
[C] = Italicized values exceed the PRG for lead.

Based upon previous reports of investigation prepared by Geotechnology, Inc., removal activities are recommended for the Hubert Wheeler State School property. Excavation of source materials should be conducted in the following areas: the suspected drum and tar burial areas, near the seep of tar-like material in the asphalt playground, and near any anomalies identified in previous investigations.

5.2 Estimated Costs

The financial cost of informing the public is expected to be limited to the costs incurred by holding a public availability session, providing copies of reports and sampling data to the public, and answering public inquiries. Initial costs of investigating the school property will include sampling and analytical costs, as well as rental fees, operator costs, and decontamination costs for a backhoe. Additional costs are likely to be incurred as the investigation of the school property progresses, depending upon the location, nature and extent of the waste materials.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Surficial soils in the residential areas east and south of the Hubert Wheeler State School property have been found to contain several PAH compounds, 2,4-dinitrotoluene, bis(2-ethylhexyl) phthalate, and lead. Based upon previous and current sampling data from the school and residential properties, the amount of contamination contained within the soils appears to increase with depth. The hazardous substances are thought to be the result of landfilling operations conducted in the area prior to the development of the neighborhood.

No additional action is recommended for the residential yards. Residential exposure to the contaminated soil may lead to an increased risk of cancer over a lifetime, but this risk is expected to be slight. The levels of contamination found in the surficial residential soils were found to be relatively low when compared with the Missouri Department of Health's Any-Use Soil Levels (ASLs), site-specific Preliminary Removal Goals (PRGs), and the findings of the expedited risk assessment. The residential soils are primarily covered by asphalt and grass, limiting unintentional human exposure to subsurface soils.

Community education is proposed to inform the residential community about the investigations within their neighborhood and to discuss the potential risks posed by exposure to subsurface soils. Once informed, residents can minimize their risk of contact with the soils, if they wish, by maintaining a healthy lawn through fertilization, watering, and reseeding as needed, washing their hands after contact with the soil, and growing edible plants in raised bed gardens.

Additional removal activities are recommended for the Hubert Wheeler State School property. Community interviews indicate that drums of tar and free-flowing tar may have been buried on the

Hubert Wheeler State School property. These reports are supported by the presence of a surficial seep of tar-like material in the vicinity of the former school's asphalt playground. This tar-like material was found to contain high levels of PAH compounds. Previous investigations of the school property indicate that there are anomalies in the subsurface which warrant investigation and subsequent removal of any free product sources of contamination.

7.0 REFERENCES

Alizadeh, P.E., Ed. Geotechnology to Gerald Bonnot, State of Missouri. Transmittal letter with draft report, Subsurface Assessment, Playground Site Restoration, Hubert Wheeler State School and other enclosures. Letter dated November 30, 1993; report dated October 4, 1993. 114 pages (total).

Allen, Brian J., Environmental Specialist, Superfund/RCRA Unit, Environmental Services Program, DNR. Phase I Removal Assessment Sampling Report, Hubert Wheeler State School Site. March 4-5, 1996 75 pages.

Agency for Toxic Substances and Disease Registry, U.S. Department of Health & Human Services. Toxicological Profile for Lead. Update. April 1993. 307 pages.

Agency for Toxic Substances and Disease Registry, U.S. Department of Health & Human Services. Toxicological Profile for Polycyclic Aromatic Hydrocarbons. Update. August 1995. 458 pages.

Baysinger-Daniel, Cherri, Environmental Specialist, Bureau of Environmental Epidemiology, DOH to Mr. Bob Hinkson, Superfund Section, DNR. Letter containing Preliminary Removal Goals for Residential Yards in the Vicinity of the Hubert Wheeler State School. (PRGs calculated at the 10^{-4} and 10^{-6} risk levels). April 15, 1996. 30 pages.

Baysinger-Daniel, Cherri, Environmental Specialist, Bureau of Environmental Epidemiology, DOH to Mr. Gary Behrns, Superfund Section, DNR. Letter containing Expedited Risk Assessment for Exposure to Residential Soils in the Vicinity of the Hubert Wheeler State School and Preliminary Removal Goals for Residential Yards in the Vicinity of the Hubert Wheeler State School (PRGs calculated at the 10^{-5} risk level). July 5, 1996. 55 pages.

Bloss, Julie A., Environmental Specialist, Superfund Section, Hazardous Waste Program, DNR. Availability Session held on September 21, 1994. Memo to file. 2 pages.

Bloss, Julie A., Environmental Specialist, Superfund Section, Hazardous Waste Program, DNR. Site Inspection Report, Hubert Wheeler State School. September 20, 1994. 28 pages.

Bloss, Julie A, Hazardous Waste Program, Division of Environmental Quality, DNR. Possible Sources of Tar Contamination. Memo to file. September 16, 1994. 5 pages.

Busch, Arthur, DOH. DRAFT Health Consultation, Hubert Wheeler State School Site, Private Residential Yards. June 20, 1996. 8 pages.

Kelsey, Julie B., Environmental Specialist, Superfund Section, Hazardous Waste Program, DNR. Removal Assessment Community Interviews. Memo to file. April 17, 1996. 8 pages.

St. Louis Globe-Democrat. "Is This the Site of the Cards' New Park?". Photograph, with caption. 1949.

Starbuck, Edith, Environmental Geology Section, Division of Geology and Land Survey, DNR. Sanborn Maps for Carondolet Coke and Hubert Wheeler sites. Memo. June 15, 1994. 6 pages.

Torretta, Mario. Map of Clay Mines in the Hill, 1923. Adapted copy of Mr. Torretta's map.

U.S. Environmental Protection Agency. Risk & Decision Making. August 1992. 120 pages.

U.S. Environmental Protection Agency, Region VII. Region VII Superfund Cleanup Goals Standard Operating Procedures. 1996. 24 pages.

U.S. Geological Survey. Webster Groves Quadrangle, 7.5-minute topographic quadrangle map of Missouri. 1954, revised 1993.

8.0 LIST OF ATTACHMENTS

8.1 Additional Assessment, Playground Site Restoration, Hubert Wheeler State School.
Prepared for Division of Design and Construction, State of Missouri by Geotechnology, Inc.

8.2 Phase I Removal Assessment Work Plan.
Prepared by Hazardous Waste Program, Division of Environmental Quality, Missouri

8.3 Removal Assessment Community Interviews.
Prepared by Julie B. Kelsey, Environmental Specialist, Superfund Section, Hazardous Waste Program, Missouri Department of Natural Resources.

8.4 Phase I Removal Assessment Sampling Report.
Prepared for Hazardous Waste Program, Division of Environmental Quality, Missouri Department of Natural Resources by Environmental Services Program, Division of Environmental Quality, Missouri .

8.5 Health Consultation, Hubert Wheeler State School Site, Private Residential Yards, City of St. Louis, Missouri. DRAFT
Prepared by the Missouri Department of Health, Bureau of Environmental Epidemiology, in Cooperation with the Agency for Toxic Substances and Disease Registry.

8.6 Preliminary Removal Goals, Hubert Wheeler State School, St. Louis, MO.
Prepared by the Missouri Department of Health, Bureau of Environmental Epidemiology.

8.7 Expedited Risk Assessment for Exposure to Residential Soils in the Vicinity of the Hubert Wheeler State School and **Preliminary Removal Goals for Residential Yards in the Vicinity of the Hubert Wheeler State School.**
Prepared by the Missouri Department of Health, Bureau of Environmental Epidemiology.

SUPERFUND REMOVAL SITE EVALUATION
and
REMOVAL PRELIMINARY ASSESSMENT

I. SITE NAME AND LOCATION:

NAME: Hubert Wheeler State School Site

ADDRESS OR OTHER LOCATION IDENTIFIER: 5707 Wilson Avenue and nearby residential neighborhood

CITY: St. Louis	STATE: Missouri	ZIP: 63110

DIRECTIONS TO SITE: From the intersection of I-44 and Hampton Avenue in the City of St. Louis, take Hampton Avenue south to Wilson Avenue, then travel east on Wilson Avenue for approximately 2 blocks. The Hubert Wheeler State School is located on the north side of Wilson Avenue. The residential neighborhood to the south and east of the school was addressed as part of the Removal Site Evaluation.

MAP ATTACHED: X

II. PROGRAM CONTACTS:

REQUESTED BY: Julie Warren	DATE OF REQUEST: 1995	
AGENCY/OFFICE: Missouri Department of Natural Resources/Hazardous Waste Program/Superfund Section		
MAILING ADDRESS: P.O. Box 176		
CITY: Jefferson City	STATE: Missouri	ZIP: 65102-0176
TELEPHONE: (573) 751-3176	FAX: (573) 751-7869	
SECONDARY/OTHER CONTACT: Robert Hinkson or Julie B. Kelsey		
AGENCY/OFFICE: Missouri Department of Natural Resources/Hazardous Waste Program/Superfund Section		
MAILING ADDRESS: P.O. Box 176		
CITY: Jefferson City	STATE: Missouri	ZIP: 65102-0176
TELEPHONE: (573) 751-3176	FAX: (573) 751-7869	

III. REMOVAL SITE EVALUATION CRITERIA [40 CFR 300.410(e)]

IS THERE A RELEASE AS DEFINED BY THE NCP: YES X or NO _

EXPLAIN: A small area of tar-like material is visible on the surface of the asphalt playground at the Hubert Wheeler State School. According to teachers of the former school, ever since the school opened in 1970, this tar-like material emerged from the ground during the spring and summer months. In 1990, the State of Missouri's Department of Elementary and Secondary Education (DESE) used a backhoe to excavate an area next to the asphalt playground, with the purpose of removing the tar-like material and determining the depth and extent of the subsurface material. According to DESE records, at a depth of four feet, an eight foot wide by nine inch thick horizontal vein of coal tar reportedly was detected moving parallel to the soil surface. A concrete walkway was installed over this area by DESE in 1990. At least one 55-gallon drum was unearthed during the construction activities.

*(A **RELEASE** is defined as any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment of barrels, containers, and other closed receptacles containing any hazardous substances or pollutant or contaminant), but excludes: workplace exposures; engine exhaust emissions; nuclear releases otherwise regulated; and the normal application of fertilizer. For purposes of the NCP, release also means threat of release.)*

IS THE SOURCE A FACILITY OR VESSEL AS DEFINED BY THE NCP: YES X or NO _

EXPLAIN: The Hubert Wheeler State School site meets the NCP definition of a facility.

*(A **FACILITY** is defined as any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or POTW), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, or aircraft or any site or area, where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any vessel. A **VESSEL** is defined as any description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water other than a public vessel.*

SUPERFUND REMOVAL SITE EVALUATION
and
REMOVAL PRELIMINARY ASSESSMENT

III. REMOVAL SITE EVALUATION CRITERIA [40 CFR 300.410(e)](continued):

DOES THE RELEASE INVOLVE A HAZARDOUS SUBSTANCE, OR POLLUTANT OR CONTAMINANT AS DEFINED BY THE NCP: YES X or NO _

EXPLAIN: Several polycyclic aromatic hydrocarbons (PAHs) were identified in the tar-like material during analytical sampling conducted by DNR in July 1994. PAHs (at lower levels) and lead have been detected in the soils surrounding the school property and in the residential neighborhood. These samples were collected in March 1996, as part of this Removal Site Evaluation (RSE) conducted by DNR.

*(A **HAZARDOUS SUBSTANCE** means any substance, element, compound, mixture, solution, hazardous waste, toxic pollutant, hazardous air pollutant, or imminently hazardous chemical substance or mixture designated pursuant to the CWA, CERCLA, SDWA, CAA or TSCA. The term does not include petroleum products, natural gas, natural gas liquids, liquified natural gas, synthetic gas or mixtures of natural and synthetic gas. The definition of **POLLUTANT or CONTAMINANT** includes, but is not limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions or physical deformations, in such organisms or their offspring. The term does not include petroleum products, natural gas, natural gas liquids, liquified natural gas, synthetic gas or mixtures of natural and synthetic gas.)*

IS THE RELEASE SUBJECT TO THE LIMITATIONS ON RESPONSE: YES _ or NO X

EXPLAIN: The release is not excluded by 40 CFR Section 300.400 (b) of the NCP.

*(The **LIMITATIONS ON RESPONSE** provisions of the NCP (40 CFR 300.400(B) states that removals shall not be undertaken in response to a release: of a naturally occurring substance in its unaltered or natural form; from products that are a part of the structure of, and result in exposure within, residential buildings or business or community structures; or into public or private drinking water supplies due to deterioration of the system through ordinary use.)*

DOES THE QUANTITY OR CONCENTRATION WARRANT RESPONSE: YES X or NO _

EXPLAIN: The quantity of tar-like material has not been determined at this time. At least one 55-gallon drum of tar has been unearthed from the property. Significant geophysical anomalies were identified in the subsurface of the school property during previous site screening activities. Information obtained from Community Interviews indicates that 12-18 full 55-gallon drums of tar were buried on the Hubert Wheeler State School property in the 1930's, at a depth of 25 feet. The suspected location of burial is east and north of the present school buildings. Additional tar is thought to have been buried on the school property during the construction of the school (1968-1970).

HAS A PRP BEEN IDENTIFIED: YES _ or NO X

EXPLAIN: Several potential PRPs have been identified. Information obtained during the Missouri DNR's PA/SI investigation and subsequent RSE have been forwarded to Ms. Maureen Hunt, of EPA Region VII, for her consideration. EPA Region VII is actively investigating possible PRPs to determine if any are viable.

IV. CONDITIONS TO WARRANT REMOVAL [40 CFR 300.415(b)(2)]:

ACTUAL OR POTENTIAL EXPOSURE TO HAZARDOUS SUBSTANCES, OR POLLUTANTS, OR CONTAMINANTS: YES X or NO

EXPLAIN: During the 24 year operation of the school, teachers and students were reportedly directly exposed to the tar-like material seeping from the ground on-site. According to information obtained during Community Interviews, neighborhood children also had contact with tar-like material prior to the construction of the school. The school community and the nearby residents have been exposed to significantly lower levels of PAHs and lead from the contaminated soils in the area.

ACTUAL OR POTENTIAL CONTAMINATION OF DRINKING WATER SUPPLIES: YES _ or NO X

EXPLAIN: Low levels of volatile organic compounds were detected in the shallow groundwater on-site. However, this aquifer is not used for drinking water purposes. Groundwater in the St. Louis area tends to be highly mineralized. There are no known drinking water wells nearby.

SUPERFUND REMOVAL SITE EVALUATION
and
REMOVAL PRELIMINARY ASSESSMENT

IV. CONDITIONS TO WARRANT REMOVAL [40 CFR 300.415(b)(2)] (continued):

HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS IN DRUMS, YES X or NO _

BARRELS, OR BULK STORAGE CONTAINERS:

EXPLAIN: At least one 55-gallon drum was unearthed on the school property. Approximately 15 additional drums of tar may be buried on the Hubert Wheeler State School property. Geophysical anomalies detected during previous investigations of the site have not been explored could indicate other instances of buried containers, metal, or hazardous substances.

HIGH LEVELS OF HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS IN NEAR-SURFACE SOILS: YES _ or NO _

EXPLAIN: A sample of the tar-like material, collected by Missouri DNR on July 7, 1994, had levels of 17 polycyclic aromatic hydrocarbon (PAH) compounds which exceeded 1,000 parts per million (ppm). The level of benzo(a)pyrene, a carcinogenic PAH, was 32,000 ppm. Significantly lower levels of PAHs and lead have been detected in surficial and subsurface soils across the school property. This low level contamination extends into the residential neighborhood.

CONDITIONS SUSCEPTIBLE TO IMPACT FROM ADVERSE WEATHER CONDITIONS: YES X or NO _

EXPLAIN: The suspected burial area of the tar-like material is a former clay mine which has been filled in with waste materials. The permeability of the fill material is expected to be high, while the surrounding clay is expected to have a low permeability. The tar-like material may be susceptible to migration from flooding.

THREAT OF FIRE OR EXPLOSION: YES _ or NO X

EXPLAIN: Not anticipated.

POTENTIAL FOR OTHER FEDERAL OR STATE RESPONSE MECHANISMS: YES _ or NO X

EXPLAIN: The State of Missouri is not known to have further investigation or remediation planned for this site at this time.

OTHER SITUATIONS OR FACTORS WHICH POSE A THREAT: YES X or NO _

EXPLAIN: The extent of tar-like contamination has not been determined. Subsurface geophysical surveys indicate that the extent of the tar-like material may be more extensive that what has been encountered at the surface. The tar material may also be migrating.

V. POTENTIAL REMOVAL ACTIONS [40 CFR 300.415(d)]:

(NOTE: The following identifies potential removal actions which may be determined to be appropriate pending further review and study. The proposed actions should be considered preliminary proposals and are subject to change.)

SITE SECURITY: YES _ or NO X

EXPLAIN: The asphalt playground, where the tar-like material has surfaced, is currently fenced. However, the remainder of the Hubert Wheeler State School property is not fenced, and is accessible to the surrounding residential population. Additional site security and access restrictions may be required for future removal activities.

SUPERFUND REMOVAL SITE EVALUATION
and
REMOVAL PRELIMINARY ASSESSMENT

V. PROPOSED REMOVAL ACTIONS [40 CFR 300.415(d)](continued):

DRAINAGE CONTROL: YES _ or NO X

EXPLAIN: Surficial runoff has not been observed at the site. Site runoff reportedly drains north toward the River des Peres drainage canal.

STABILIZATION OR REMOVAL OF SURFACE IMPOUNDMENTS: YES _ or NO X

EXPLAIN: Not applicable.

CAPPING OF CONTAMINATED SOIL: YES X or NO _

EXPLAIN: This is a possible option, but would not resolve the issues surrounding the potential for a free-product source of tar migrating through the subsurface. Capping after the excavation of the tar-like material may be a viable option.

USE OF CHEMICALS TO CONTROL/RETARD SPREAD OF CONTAMINATION: YES X or NO _

EXPLAIN: This is a possible option for the contaminated soils, if chemicals could be found which could facilitate bioremediation of the PAH compounds. The free-product tar material would probably still require excavation and off-site disposal.

CONTAMINATED SOIL EXCAVATION: YES X or NO _

EXPLAIN: This is a recommended option.

REMOVAL OF DRUMS, TANKS, OR BULK STORAGE CONTAINERS: YES X or NO _

EXPLAIN: This is a recommended option.

CONTAINMENT, TREATMENT, OR DISPOSAL OF HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS: YES X or NO _

EXPLAIN: If the source material is found during subsurface investigations of the Hubert Wheeler State School property, appropriate segregation and disposal of this material (according to all applicable laws and regulations) will be warranted.

SUPERFUND REMOVAL SITE EVALUATION
and
REMOVAL PRELIMINARY ASSESSMENT

V. PROPOSED REMOVAL ACTIONS [40 CFR 300.415(d)](continued):

PROVIDE ALTERNATIVE WATER SUPPLIES: YES _ or NO X

EXPLAIN: Not applicable.

VI. REMOVAL SITE EVALUATION DETERMINATION AND REMOVAL PRELIMINARY ASSESSMENT FINDINGS AND RECOMMENDATIONS:

	REMOVAL NOT WARRANTED - REMOVAL SITE EVALUATION TERMINATED

*(Cite one or more of the criteria from SECTION III. **REMOVAL SITE EVALUATION CRITERIA**, as the basis for the above determination.)*

		NOT A RELEASE			NOT A FACILITY OR VESSEL
		NOT A HAZARDOUS SUBSTANCE OR POLLUTANT OR CONTAMINANT			SUBJECT TO RESPONSE LIMITATIONS
		INSUFFICIENT QUANTITY OR CONCENTRATION			WILLING/CAPABLE PRP IDENTIFIED

COMMENT:

X	REMOVAL RECOMMENDED [_ EMERGENCY _ TIME-CRITICAL X NON-TIME-CRITICAL]

*(Cite one or more of the conditions or factors from Section IV. **CONDITIONS TO WARRANT A REMOVAL ACTION**, as a basis for recommending that a removal action be conducted.)*

	X	EXPOSURE TO HAZARDOUS SUBSTANCES OR POLLUTANTS OR CONTAMINANTS			X	ADVERSE WEATHER IMPACTS
		CONTAMINATED DRINKING WATER		FIRE/EXPLOSION THREAT	X	CONTAMINATED SOIL
	X	DRUMS, BARRELS OR CONTAINERS		NO OTHER RESPONSE MECHANISM		OTHER FACTORS

*(Identify one or more of the removal actions listed in Section V. **REMOVAL ACTIONS WHICH MAY BE APPROPRIATE**, as examples of the types of response actions which are recommended.)*

	X	SITE SECURITY		DRAINAGE CONTROL		IMPOUNDMENT STABILIZATION
	X	REMOVAL OF DRUMS, BARRELS, ETC.	X	SOIL CAPPING	X	SOIL EXCAVATION
	X	CONTAIN/TREAT/DISPOSE OF WASTES	X	CHEMICAL CONTROLS		ALT. DRINKING WATER SUPPLIES

COMMENT:

A removal action, with further source characterization, is recommended for the school property. The area beneath the school may require special consideration. Removal of drums, barrels, free-product tar material and affected soils may be needed. Segregation of contaminated materials and free product, with proper treatment and/or disposal, is recommended. A cap of the site may be necessary after the source materials have been removed.

At this time, community education is the only action recommended for the nearby residential community. Information should continue to be provided to the community by the agency conducting the site activities.

SUPERFUND REMOVAL SITE EVALUATION
and
REMOVAL PRELIMINARY ASSESSMENT

VI. REMOVAL SITE EVALUATION DETERMINATION AND REMOVAL PRELIMINARY ASSESSMENT FINDINGS AND RECOMMENDATIONS (continued):

☐ ADDITIONAL REMOVAL SITE EVALUATION RECOMMENDED

*(Cite one or more of the conditions or factors from Section IV. **CONDITIONS TO WARRANT A REMOVAL ACTION**, as a basis for recommending that additional site evaluation be performed.)*

		EXPOSURE TO HAZARDOUS SUBSTANCES OR POLLUTANTS OR CONTAMINANTS					ADVERSE WEATHER IMPACTS
		CONTAMINATED DRINKING WATER		FIRE/EXPLOSION THREAT			CONTAMINATED SOIL
		DRUMS, BARRELS OR CONTAINERS		NO OTHER RESPONSE MECHANISM			OTHER FACTORS

*(Identify one or more of the removal actions listed in Section V. **REMOVAL ACTIONS WHICH MAY BE APPROPRIATE**, as examples of the types of response actions which may be appropriate pending the results of further site evaluation.)*

		SITE SECURITY		DRAINAGE CONTROL			IMPOUNDMENT STABILIZATION
		REMOVAL OF DRUMS, BARRELS, ETC.		SOIL CAPPING			SOIL EXCAVATION
		CONTAIN/TREAT/DISPOSE OF WASTE		CHEMICAL CONTROLS			ALTERNATIVE DRINKING WATER SUPPLIES

COMMENT:

VII. ADDITIONAL INFORMATION OR COMMENTS

VIII. CERTIFICATION

SIGNATURE: _____ _____
DATE

POSITION/TITLE:

OFFICE/AGENCY:

SUPERFUND REMOVAL SITE EVALUATION
and
REMOVAL PRELIMINARY ASSESSMENT
(Supplemental Waste Inventory Sheet)

IX. HAZARDOUS SUBSTANCES, POLLUTANTS OR CONTAMINANT INFORMATION:

MATERIAL DESCRIPTION	CONTAINER INFORMATION					
TRADE NAME/ACTIVE INGREDIENTS	NUMBER of CONTAINERS	SIZE	TYPE	SOLID or LIQUID	% FULL	CONDITION